

continued from page 3

So the focus here will be on a few of the tests as an example of how the blood offers valuable insight into your health status. We will discuss the enzymes Creatine Phosphokinase (CPK) and Lactic Dehydrogenase (LDH), important indicators of heart disease, liver disease, and cancer. Further testing, if warranted, for the subcomponents of both CPK and LDH can provide even more information.

Creatine Phosphokinase (CPK)

Creatine Phosphokinase, or CPK, is an enzyme found in skeletal and myocardial (heart) muscle. CPK catalyzes the transfer of high-energy phosphate to form ATP (energy that is used to perform work) and creatine (a byproduct). Determining the CPK activity is useful in diagnosing cardiovascular disease. CPK activity is frequently elevated in cases of pulmonary disease, diabetic acidosis, and alcoholism. But exercising before the blood tests are performed will also elevate CPK levels. **This has been observed frequently in the astronaut population, a group characterized by regular exercise.**

CPK occurs as three isoenzymes, each having two components composed of M (muscle), and B (brain) subunits. CPK-BB is found primarily in the brain, CPK-MB primarily in cardiac muscle, and CPK-MM primarily in skeletal muscle. Differential determination of isoenzymes is useful for clinical diagnoses.

CPK-MB is the gold standard for diagnosing myocardial injury, especially acute myocardial infarction, more commonly known as a heart attack. Changing levels of CPK-MB in serially collected blood from patients with suggestive signs and symptoms of a heart attack is characteristic of a heart attack. Following a heart attack, a CPK-MB determination may be done to estimate the extent of damage to the heart. CPK-MB levels usually peak within the first 48 hours, and the level drops back to normal as the acute stage of the injury subsides.

Elevations in CPK-MB may also be induced by other types of inflammatory, traumatic, and miscellaneous forms of injury to the heart. Trace activities of CPK-MB are from skeletal muscle. Increased levels of CPK-MB are also seen in conditions such as rhabdomyolysis (degeneration of skeletal muscle), Duchenne's muscular dystrophy, intravenous drug abuse, septic shock, and some cases of acquired immune deficiency syndrome (AIDS) as well as in patients undergoing cardiopulmonary bypass procedures. Elevated CPK-MB may be a marker in the diagnosis of colon cancer.

The CPK-BB fraction of CPK has been found to be present in significant concentration in the serum and pleural fluid of patients with

carcinoma of the lung and prostate.

There is some evidence that CPK-MM may be helpful in diagnosing acute myocardial infarction. It may assist in early identification of patients with acute myocardial infarction when ECG tests do not support a diagnosis of myocardial infarction. CPK-MM is the component that is elevated with exercise.

Lactic Dehydrogenase (LDH)

Lactic Dehydrogenase, or LDH, is an enzyme found in nearly all cells. This enzyme is important in metabolizing lactate, which is a by-product produced during physical activity. LDH is found especially in the liver, kidneys, striated muscle, and the myocardium. It tends to accumulate in the body when these organs or tissues are diseased or injured.

LDH may provide evidence of altered liver activity of different types such as obstruction and internal injury. LDH has also been used as a marker for the presence of cancer and is a good predictor of liver metastases following diagnosis of colorectal cancer. Although elevated LDH does not, by itself, indicate cancer, LDH is known to be elevated in presence of advanced testicular germ cell tumors and can indicate persistence or recurrence of tumors.

LDH has several molecular forms called isoenzymes. Some LDH isoenzymes are present in certain tissues to a greater extent than in others. When one of these particular tissues is damaged, an isoenzyme of LDH is released into the blood. In that case, determination of the pattern of LDH isoenzymes in serum may help to identify which tissue has been damaged. If requested by your physician, further testing of these isoenzymes can help with diagnosing conditions such as myocardial infarction, acute viral hepatitis, cerebrovascular disease, and liver disease.

Cancer must be suspected any time LDH is elevated and the isoenzyme pattern cannot be explained by other conditions. LDH isoenzymes are used to predict risk of colon cancer in high risk colon cancer families and in patients with numerous polyps.

Testing for the two enzymes and their isoenzymes discussed here clearly can offer important, even vital, information about your health. Yet, these are just two of the 30-35 blood tests that are performed during your LSAH examination. Your participation in this part of the LSAH, as well as the rest of the study, is an excellent opportunity to take a "photograph" of your health.



Newsletter

A SEMIANNUAL PUBLICATION OF THE LONGITUDINAL STUDY OF ASTRONAUT HEALTH

November 1993

Volume 2 • Issue 2

Figure 1
Distribution of comparison participants needed for an exact 3:1 ratio by selection year and the distribution of the recruited participants.

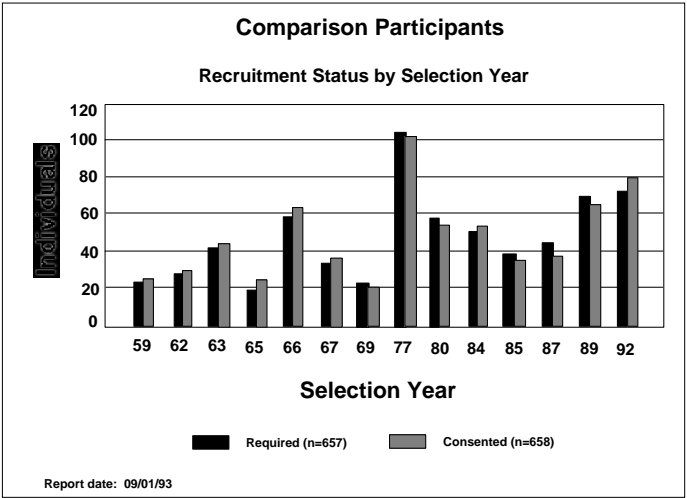
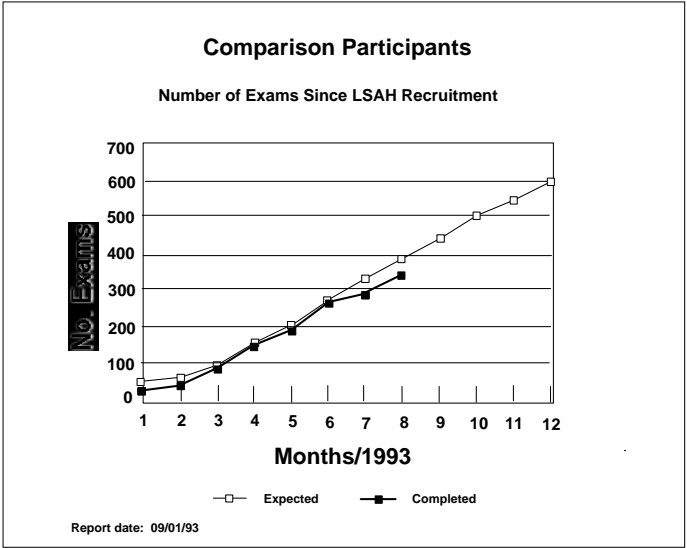


Figure 2
Expected cumulative number of examinations to be completed by the comparison group and the number of actual examinations to date for 1993.



In this issue

Participant response, 1

JSC Wellness Program and the LSAH, 2

Mammograms for LSAH participants, 3

Blood tests, 3

In the next issue...

Articles on blood testing for Prostate Specific Antigen (PSA—a serum marker for prostate cancer), treadmill tests, diet and exercise information, and an update on the study's progress. The study has gotten off to an excellent start because of you. Thanks for your continued support!

Moving? New phone number?

Please let us know by calling (713) 212-1362 or (713) 483-5785

or write us at:

Longitudinal Study of Astronaut Health
Flight Medicine Clinic/SD26
NASA/Johnson Space Center
Houston, Texas 77058

Selected JSC employees are now participating in the LSAH. The type and frequency of medical events that occur among the astronauts are being compared with those events that occur among this group of basically healthy JSC employees. The recruitment goal was an overall 3:1 ratio of comparison participants to astronauts, i.e., 657 employees compared with 219 astronauts. A total of 658 individuals agreed to participate. A 3:1 ratio provides us with more data than a smaller sample size, which allows us to detect the less common effects of exposure to spaceflight. Figure 1 shows both the distribution of comparison participants needed for an exact 3:1 ratio by astronaut selection class year and the distribution of the recruited participants. Although each selection year does not have an exact 3:1 ratio, the overall 3:1 ratio is achieved.

The baseline exam is the physical exam completed during the astronaut selection class year to which each participant is matched. We need to obtain current medical information from each LSAH participant, both the comparison participants and the astronauts, on a regular basis throughout the follow-up period. Participants are being contacted by mail during the month before their birth month with a reminder to schedule an appointment for a physical examination at the JSC Clinic. If an appointment cannot be scheduled during the year, medical records from a private physician can be used.

All astronauts who are currently active in the program, and the majority of those who have left the astronaut corps, have had physical examinations routinely in the JSC Flight Medicine Clinic. The response from the comparison group has also been excellent. Figure 2 shows the expected cumulative number of examinations to be completed by the comparison group and the number of actual examinations through 1993.

Data organization is underway. We plan to enter all baseline data into the data base by the end of 1993. Adherence to data security measures is being strictly enforced to ensure participants' privacy. This will be followed by a publication of the study design and baseline characteristics of the two groups. We will keep you informed regarding publications.

JSC’s Total Health program and the LSAH

JSC's *Total Health* employee wellness program was launched the week of August 9, 1993. The program is designed to target NASA employees with health risks, educate and support those who are trying to reduce health risks caused by lifestyle choices, and provide frequent medical monitoring for those with known health problems. The “routine annual” physical exam for young, healthy individuals is no longer considered necessary by nationally recognized health care and physician groups.

How will this program affect LSAH participants? Following are some commonly asked questions by the study’s participants.

How often will I receive a physical exam?

As an LSAH participant, you will be offered a complete physical exam **every two years** as long as you are healthy. Should you have a change in your medical condition, or an identified health risk, the Clinic physician may direct more frequent Clinic visits. Keep in mind that the frequency of your physical exams will be different from that of your colleagues who are *not* LSAH participants until you reach age 45. The Total Health exam cycle for healthy NASA employees is every three years until age 45 and every two years after age 45.

Do I go to the Clinic for anything in the years between doctor visits?

In the years between physical examinations, current JSC employees will receive a “birthday letter” inviting them to schedule an appointment for a cholesterol check. During this appointment, blood will be drawn for a complete cholesterol analysis, including total cholesterol, LDL, HDL, the risk ratios, and triglycerides. Height, weight, and blood pressure will also be measured, and we’ll update tetanus/diphtheria immunizations in addition to offering a TB (tuberculosis) skin test. Laboratory results will be mailed along with an explanation of the values. Of course, access to the Clinic and the physicians for occupational injury, illnesses, travel advice, allergy injections, blood pressure screening, etc., will remain the same as it is now.

How often will I have a treadmlll test?

LSAH participants will be offered a treadmill test with the same frequency that astronauts receive theirs. If there are no identified heart problems, you will have a treadmill every five years until age 40 and every two years after age 40.

How often will I have a procto (proctosigmoidoscopy)?

Here, again, you will be on the same schedule as the astronauts—every three years from ages 40-49 and every two years after age 50.

I’ve read about the PSA (Prostate Specific Antigen) test for prostate cancer. Is this test part of the LSAH?

The PSA test is a blood test that is part of the LSAH and Total Health protocols. LSAH participants are tested for PSA as are the astronauts. The Total Health program offers PSA testing to JSC employees, beginning at age 49 or 50.

Will annual Pap smears (Papanicoulau tests) still be available?

A Pap smear will be offered to female participants at the time of their physical exams. In the years between complete physical exams, a birthday letter will be mailed inviting women to make an appointment with the Clinic for a Pap smear. As an alternative, some women may choose to have this test performed by their private physician. In this case, we ask that you obtain a copy of the Pap smear report for the Clinic to file in your NASA medical record.

May I still receive a mammogram through the Clinic?

Routine mammograms will continue to be offered to female participants beginning with a baseline by age 40, then every two years after age 40. The LSAH and Total Health letters will indicate when it is time to contact the Clinic to arrange for a mammogram.

The Total Health program may be adjusted for individuals with different medical needs. Certainly, if a medical condition occurs or changes, more frequent evaluations by a physician may be indicated. Don’t hesitate to contact the Clinic and let us know about any changes. The Total Health telephone number is **483-4111**.

Mammograms offered to LSAH female participants

LSAH female participants have the opportunity for a mammogram at the Breast Diagnostic Clinic in Clear Lake. The American Cancer Society currently recommends that all women receive a baseline mammogram by age 40. From ages 40 through 49, women should have a mammogram every one to two years, and from age 50 and older, an annual mammogram is recommended. The LSAH offers a baseline mammogram to women from ages 35 through 39 and, at each complete physical examination, to women 40 or older. If you fall into these age ranges, we encourage you to take advantage of this opportunity.

Breast cancer is the most common form of cancer among American women. One in nine American women will develop breast cancer during her lifetime. About 44,500 will die this year because of breast cancer. Only lung cancer causes more cancer deaths among women.

The exact cause of breast cancer is not known, but many epidemiological studies have helped to identify a number of factors that carry varying degrees of risk for breast cancer. Major risk factors include: (1) older than age 40, and especially older than 50; (2) personal history of breast cancer; (3) family history of breast cancer; (4) never giving birth, or first delivery after age 30; and, (5) long menstrual history (menstrual periods started early and ended late in life).

Breast cancer and cancers of the ovary, endometrium (lining in uterus), and colon seem to be linked to dietary habits and obesity. Women who have ovarian cancer have a somewhat higher risk of developing breast cancer, and women cured of breast cancer are at increased risk of developing cancer in the other breast, the endometrium, or colon.

Monthly breast self-examinations and yearly breast examinations by a health professional

are essential for early detection of breast cancer. However, some cancers can be present in the breast for years before they can be felt. Mammography can detect these abnormalities. Mammography is a technique which provides a finely detailed view of the breast. It can detect abnormal changes in the breast before a lump is large enough to be felt. If a cancerous growth is found early enough, there are more ways in which it can be successfully treated, and the chance for cure is greater.

Mammography is a safe, low-dose X-ray technique that creates images of the inside of the breast. The X-rays pass through the breast and create an image on a film or plate. On the X-ray itself, an abnormal area appears noticeably different from normal breast tissue. Two sets of X-rays, called mammograms, are usually taken for each breast — a side view and a view from above. The mammogram is then read by a radiologist, a physician specially trained to

read a mammogram and to recognize any variations from the norm.

In the past, there was some concern about the amount of radiation to which a patient was exposed during a mammogram. Improved equipment and techniques now result in minimal exposure, with no significant increase in the risk of developing breast cancer in the future because of repeated mammograms. The level is so low now that it is nearly equivalent to the natural radiation in our environment.

Researchers estimate that more than half-a-million women in the United States have undiagnosed breast cancer that could be detected by mammography. Many of these cases are curable if caught in time. It makes good sense to have the recommended mammography added to your health program. Also, ask the clinic staff about personal training, videos, and other materials on the self breast exam.

Blood tests: a photograph of your health

When you come into the JSC Clinic for an LSAH examination, part of the exam includes giving blood. A sample of your blood provides a wealth of information about your health.

As blood moves through your body, it carries nourishment, electrolytes, hormones, vitamins, antibodies, heat, and oxygen to the tissues and takes away waste products. Variations in the levels of these blood components provide indications of physiological changes. Sometimes these variations are the first clue to an unsuspected disease, or they may provide information about the status of a known condition.

For a particular test, you may notice that your results fall outside the reference intervals. Remember that there are a number of reasons why this may happen. Keep in mind it is only a single test; a

test result may fall outside the reference interval as a result of normal variations. The reference intervals may vary at different laboratories because of differences in instrumentation and methodology. A variety of factors may affect some blood test results, such as your age, sex, time of day the test was done, and what you ate before the test. Occasionally a test result may be attributable to a laboratory error. Exercising before coming in for the blood tests can affect test results, as is the case with CPK levels (discussed below). It is important to let your doctor interpret your test results for you, taking into account all of the above factors.

The variety of blood tests performed as part of your LSAH examination are too numerous to cover adequately in this space.

continued on page 4